

Trans-border (east Serbia/west Bulgaria) correlation of the Jurassic sediments: main Jurassic paleogeographic units

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Abstract. In the region across the Serbian/Bulgarian state border, there are individualized 5 Jurassic paleogeographic units (from West to East): (1) the Thracian Massif Unit without Jurassic sediments; (2) the Lužnica-Koniavo Unit – partially with Liassic in Grsten facies and with deep water Middle Callovian–Kimmeridgian (*p. p.*) sediments of the type “*ammonitico rosso*”, and Upper Kimmeridgian–Tithonian siliciclastics flysch; (3) The Getic Unit subdivided into two subunits – the Western Getic Sub-Uni – without Lower Jurassic sediments and the Eastern Getic Sub-Unit with Lower Jurassic continental and marine sediments, which are followed in both sub-units by carbonate platform limestones (type Stramberk); (4) the Infra (Sub)-Getic Unit – with relatively deep water Liassic and Dogger sediments (the Dogger – of type “black shales with *Bossitra alpina*”) and Middle Callovian–Tithonian – of type “*ammonitico rosso*”; (5) the Danubian Unit – with shallow water Liassic, Dogger and Malm (Miroč–Vrška Čuka Zone, deep water Dogger and Malm (Donjomilanovac–Novokoritska Zone).

Key Words: Jurassic, paleogeographic units, south-eastern Serbia, western Bulgaria.

Апстракт: У подручју српско-бугарске државне границе издвојено је пет јурских палеогеографских јединица (од запада ка истоку): 1. Трахијски масив без јурских седимената; 2. Лужница–Кониаво – делимично са лијасом развијеним у грестенској фацији и са дубоководним седиментима средњег каловеја–кимерица (*p. p.*) типа “*ammonitico rosso*” и силикокластичним флишом горњег кимерица–титона; 3. Гетикум, подељен на Западногетску подјединицу без доњојурских седимената и Источногетску подјединицу са доњојурским континенталним и маринским седиментима после којих у обе подјединице следе кречњачки карбонатске платформе (типа Stramberk); 4. Инфра(суб)гетикум са релативно дубоководним седиментима лијаса и догера (догер типа “црних глинаца са *Bossitra alpina*”) и средњег каловеја–титона (типа “*ammonitico rosso*”); 5. Данубијска јединица са плитководним лијасом, догером и малмом (зона Мироч–Вршка Чука), дубоководним догером и малмом (Доњомилановачка–новокоритска зона).

Кључне речи: јура, палеогеографске јединице, југоисточна Србија, западна Бугарска.

Introduction

During the Springer of 2005, a Serbian–Bulgarian team commenced bilateral research with the aim of making an effort to unify the views of Bulgarian and the Serbian geologists concerning the geology of the Jurassic on both sides of the Bulgarian/Serbian border. For the beginning, an attempt will be made to unify our

opinions on the main paleogeographic units and subsequently new research on the lithostratigraphy and the correlation of Jurassic sediments from both side of the border will be performed.

During the Jurassic, from the Romanian Carpathians, the following main paleogeographic units can be prolonged in eastern Serbia: Thracian Massif Unit, Lužnica–Koniavo Unit, Getic, Infra (Sub)-Getic, Danubian. They

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are more or less accepted by the Serbian geologists, but are not used in Bulgaria. These units, which are strictly paleogeographic and differ from the present day tectonic units, have a bipartite structure, built of two ensem-

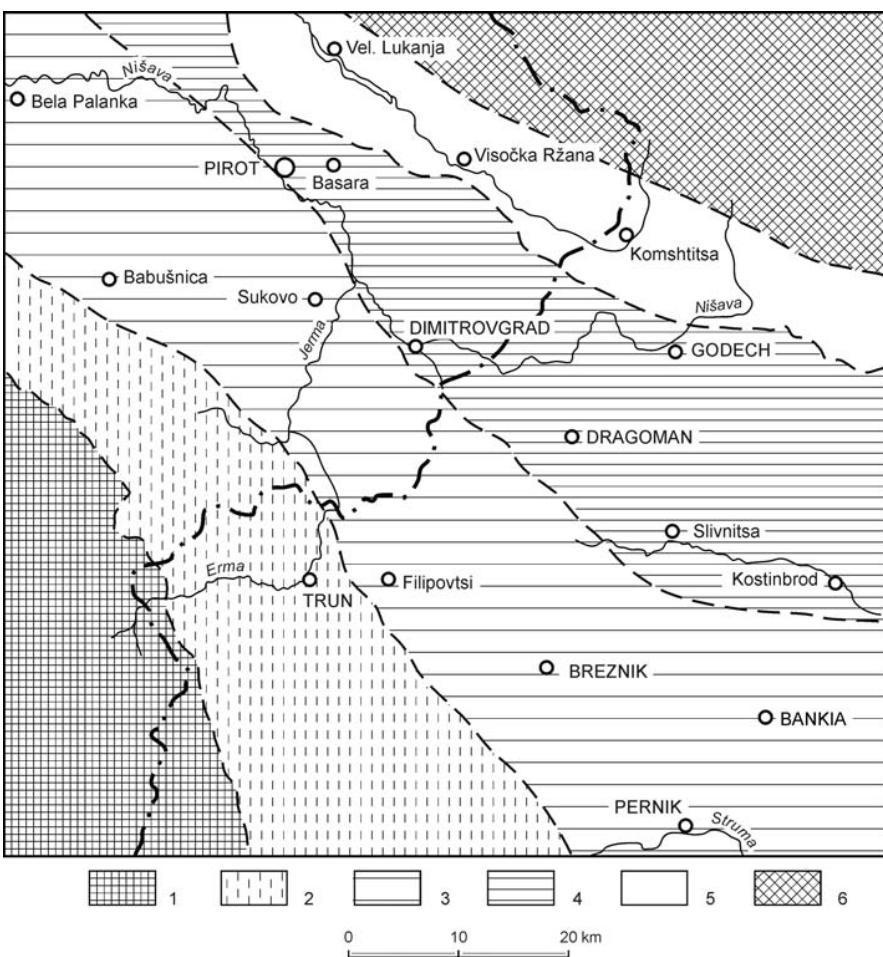


Fig. 1. Main Jurassic paleogeographic units in south-eastern Serbia and western Bulgaria. 1, Thracian Massif Unit; 2, Lužnica-Koniavo Unit; Getic Unit; 3, Western Getic Sub-Unit; 4, Eastern Getic Sub-Unit; 5, Infra (Sub)-Getic Unit; 6, Danubian Unit.

bles of beds – lower (the Lower Jurassic up to the Lower Callovian) and upper (the Middle Callovian–Tithonian). From the differences in these two parts, the main paleogeographic units in the studied region were reconstructed.

The Thracian Massif Unit (Fig. 1)

The name Thracian Massif Unit is used for the paleogeographic unit which unifies the Rhodope Massif, the Serbo-Macedonian Massif and the Srbsko-Makedonska Masa (DIMITRIJEVIĆ, 1992), etc. During the Jurassic, the Thracian Massif Unit played the role of source area and was never covered by sea water, and hence there are not marine sediments on it. For this unit (ANDJELKOVIĆ *et al.*, 1996) used the name of Moravska Zone.

The Lužnica–Koniavo Unit (Figs. 1, 2)

A characteristic for the Jurassic of this paleogeographic unit is the almost complete lack of Lower Jurassic sediments and the presence of Upper Jurassic deep water deposits. Lower Jurassic deposits exist only in the Svetlya paleo-graben in western Bulgaria. They are represented (Fig. 2) in the base by continental clays and sandstones (of Gresten facies), covered by Middle and Upper Liassic bioclastic and sandy limestones (of type Gresten – *sensu lato*). Apart from the territory of the Svetlya graben, during the Early Jurassic, the terrain of the Lužnica–Koniavo Unit represented dry land. During the Middle Jurassic (DODEKOVA *et al.*, 1984), the whole area was covered by shallow marine waters, and sandstones and higher bio- and lithoclastic limestones were sedimented. Only in the western part of the territory of Bulgaria were black shales deposited. With the Middle Callovian started a relative subsidence of the terrain and the formation of “*ammonitico rosso*” type sediments, and since the Late Kimmeridgian, the deposition of flysch type alternation of argillites/marls and graded bedding sandstones – Niš-Troyan Flysch Trough (Basin) (NACHEV, 1976), Lužnica Flysch, or Ruj Flysch (DIMITRIJEVIĆ & DIMITRIJEVIĆ, 1987) started. As a whole, the terrain is noted as Supra Getikum (DIMITRIJEVIĆ, 1992), or Supragetic units (SANDULESCU & DIMITRESCU, 2004). This unit is noted (ANDJELKOVIĆ *et al.*, 1996) as the tectonic structure Lužnička nappe (K-I) of the Karpatikum. In Bulgaria (TCHOUMATCHENCO, 2002) the name Jurassic Kraishtides is used for this unit. To avoid discordance between the meaning included by the different authors, the most neutral term of Lužnica–Koniavo Unit is used here.

The Getic Unit (Figs. 1, 2)

The paleogeographic unit with the same name is well known in the Romanian East and South Carpathian (SANDULESCU & DIMITRESCU, 2004; etc.), as well as in Serbia (DIMITRIJEVIĆ, 1992; KRAÜTNER &

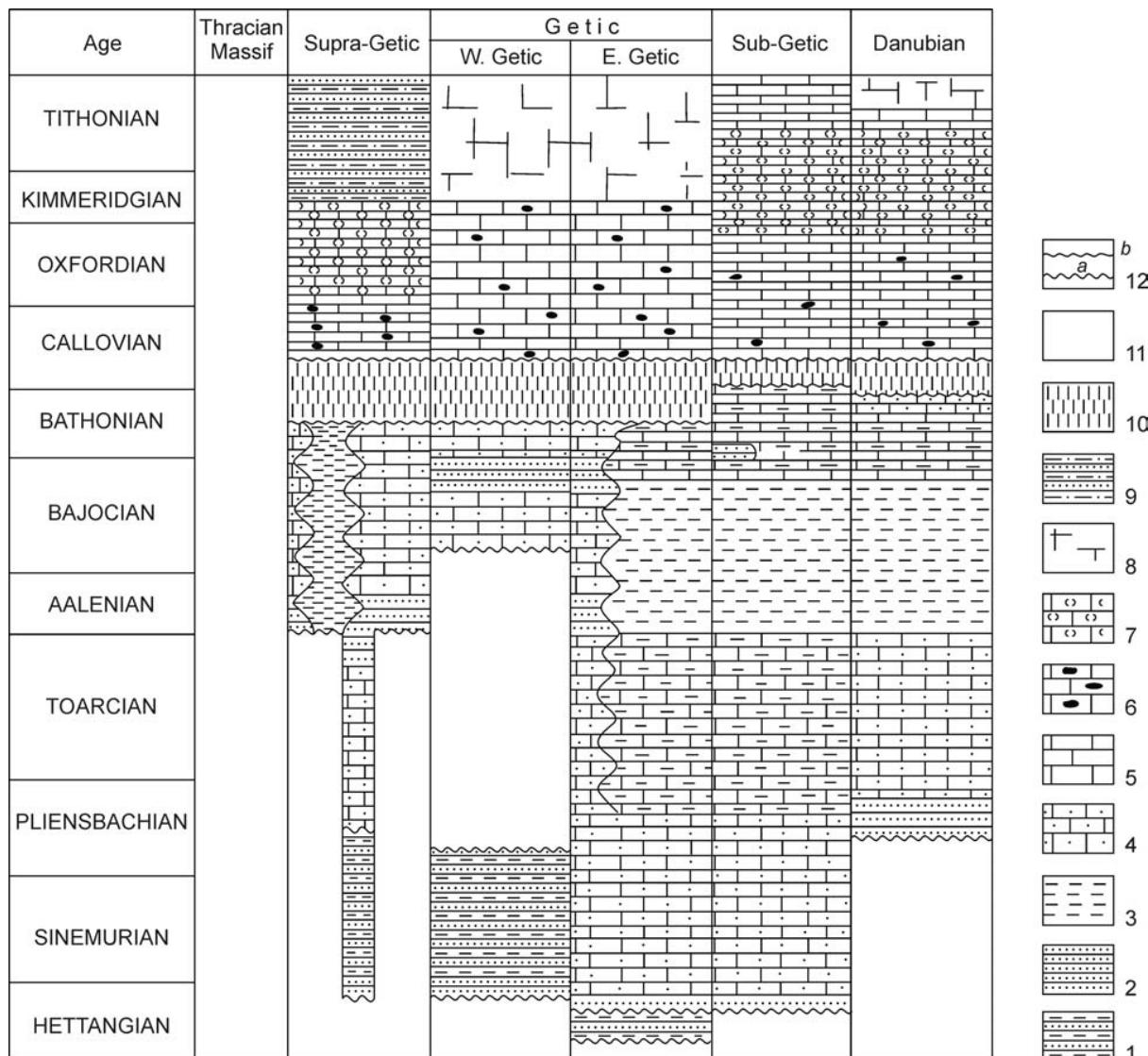


Fig. 2. Stratigraphical section across the main Jurassic paleogeographic units in south-eastern Serbia and western Bulgaria. **1**, Continental clays and sandstones (Gresten facies); **2**, sandstones; **3**, black shales; **4**, sandy and bioclastic limestones; **5**, micritic limestones; **6**, micritic limestones with chert concretions; **7**, nodular and lithoclastic limestones (type “*ammonitico rosso*”); **8**, thick bedded limestones (type “*Stramberk*”); **9**, flysch type alternation of sandstone and clay; **10**, interval with submarine break in the sedimentation; **11**, interval with aerial break in the sedimentation (dry land conditions); **12**, stratigraphic boundaries: a, transgressive; b, connected with submarine break in the sedimentation.

KRSTIĆ, 2003). In the Bulgarian literature, this paleogeographic unit is known as Dragoman Jurassic Horst (SAPUNOV *et al.*, 1985). As a Jurassic paleogeographic unit, the Getic finished in the region south of the town of Pernik on Bulgarian territory, where it is “cut” by the Thracian Massif (its Rhodope part).

More uniform for the Getic Unit is the upper part (beds), which consist of Callovian–Upper Jurassic–Lower Cretaceous thick bedded carbonate platform limestones, in many places with coral reefs. However the lower part – the Jurassic sediments lying below these thick bedded bioclastic limestones is different in different parts of the Getic Unit. This permitted the division

of the Getic Unit into two sub-units: the Western Getic Sub-Unit with Middle Jurassic marine sediments and the Eastern Getic Sub-Unit with Lower and Middle Jurassic in the lower part.

The Western Getic Sub-Unit (Figs. 1, 2)

The Western-Getic Sub-Unit is situated to the East of the Lužnica–Koniavo Unit. It is structured by two parts. The lower part is built up of Middle Jurassic shallow water sandstones and sandy and bioclastic limestones, which lie locally on continental Lower Juras-

sic clays and sandstones of Gresten facies. The upper part is built up of relatively thick bedded carbonate platform limestones, in the lower part with concretions of white chert and in the upper part by chert-free thick bedded shallow water bioclastic limestones.

The Western Getic Sub-Unit represents the Karpatikum in the territory of Serbia and enters into the following tectonic units (ANDJELKOVIĆ *et al.*, 1996): K-II – Gornjačko-Suvoplaninska nappe, K-IV – Kučaj-sko-Svrljiška nappe.

The Eastern Getic Sub-Unit (Figs. 1, 2)

The characteristic for this paleogeographic unit (e.g. the section of Berende Izvor in western Bulgaria) is the presence of Lower Jurassic sediments upwards from the base: continental clay and sandstones, marine sandstones, bioclastic limestones and marls, interbedded by clayey limestones, and of Middle Jurassic black shales with *Bositra alpina* (facies well known in the Alps), followed by clayey limestones and marls, capped by a thin bed of sandy, crinoidal limestones. To West (e.g. near the town Slivnitsa), the Liassic is represented by iron red limestones, and the Dogger by sandstones and bioclastic limestones, similar to those in the Western Getic Sub-Unit. The upper parts are also similar to those of the Western Getic Sub-Unit – thick bedded limestones, in the base with concretions of white chert, and capped by chert free limestones. These sediments build the Vidlič Mountain in Serbia and are individualized as Vidlič Scale (KRAÜTNER & KRSTIĆ, 2003), or Vidlička nappe (K-VII) (ANDJELKOVIĆ *et al.*, 1996). In Bulgaria it is part of the Dragoman paleo-horst (SAPUNOV *et al.*, 1985).

The Infra (Sub)-Getic Unit (Figs. 1, 2)

The Infra (Sub)-Getic Unit, with relatively deeper water sediments is situated to the east of the Getic Unit. It is built also built up of two parts: lower and upper. The sedimentation (Fig. 2) of the lower part started during the Late Hettangian with marine sandstones, continued with bioclastic limestones, followed by marls, intercalated by clayey limestones. The Middle Jurassic is represented by black shales with *Bositra alpina*, followed by marls and clayey limestones, similar to those in the lower part of the Eastern Getic Sub-Unit. The Middle Callovian–Tithonian sediments are represented by lithoclastic and nodular grey and red limestones, similar to the facies “*ammonitico rosso superiore*”, well-known in the Alps. In Bulgaria, the Infra-Getic paleogeographic Unit is known as Izdremets Paleogaben (SAPUNOV *et al.*, 1985). In the Serbian literature it is known as Infra Getikum (DIMITRIJEVIĆ, 1992), Dobrodolsko-Griška nappe (K-VIII) of the Karpatikum and the Staroplaninsko-Porečka Unit (ANDJELKOVIĆ *et al.*, 1996), or Upper Danubian (KRAÜTNER & KRSTIĆ, 2003).

The Danubian Unit (Figs. 1, 2)

The terrain of the Danubian Unit is situated to the East of the Infra (Sub)-Getic Unit. The Lower Jurassic is represented by shallow water breccio-conglomerates, sandstones, clays, clayey limestones with bivalves and sparite limestones with crinoids. The Middle Jurassic in the region of Danubian Unit is represented by two facies: (a) the Klaus facies (red nodular and ferruginous limestones of Upper Bajocian, Bathonian and Lower Callovian age – stratigraphical condensation; (b) laterally it passed to black shales with *Bositra alpina*. The Callovian–Upper Kimeridgian is developed in the facies “*ammonitico rosso*” (Donjomilanovačko–Novokoritska region in Serbia and Mihaylovgrad Paleo-Graben in Bulgaria). The Oxfordian–Berriasian in Serbia is built of deep water sediments: radiolarites and limestones with cherts.

In the Bulgarian literature (SAPUNOV *et al.*, 1988), this Unit is known as the Vratsa Jurassic Horst; in the Serbian literature it is individualized as Milanovačko–Novokoritska Unit (ANDJELKOVIĆ *et al.*, 1996), the Danubikum (DIMITRIJEVIĆ, 1992), the Lower Danubian Units (KRAÜTNER & KRSTIĆ, 2003), etc.

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Резиме

Упоређење седмената главних јурских палеогеографских јединица у граничној области источне Србије и западне Бугарске

На бугарским и српским геолошким картама (нпр. геолошке карте Србије и Бугарске у размери 1:100000, недавно објављене у обе земље) "нормално" се види да захватају терене само до државне границе. Са обе стране границе геолошке карте су потпуно различите и веома је тешко утврдити односе геолошких јединица. Због тога је једна мешовита српско-бугарска екипа геолога у пролеће 2005.

године започела истраживања у области државне границе у циљу усаглашавања гледишта о геологији јуре са обе стране бугарско-српске границе. За почетак покушавамо да усагласимо наша мишљења о главним палеогеографским јединицама, а затим да упоредимо јурске седименте на обе стране границе.

Главне палеогеографске јединице из времена јуре које се протежу од румунских Карпата у источном Србији су: Тракијски масив, Лужница–Кониаво, Гетикум, Инфра(суб)гетикум и Данубијска јединица. Њих мање или више прихватају српски геолози, али се та подела не примењује у Бугарској. Највећа разлика је у појму "јужни Карпати". У Бугарској, према BONCHEV-u (1936, 1938) до новијих радова DABOVSKI *et al.* (2002) и NACHEV & NACHEV (2003), "јужним Карпатима" су се називали само доњокредни и горњокредни седименти северозападне Бугарске на Крајинским висовима западно од вароши Кула – зона простирања синајског флиша. За друге седименте који прелазе српско-бугарску границу, а који се настављају на јурске јединице румунских Карпата, користе се бугарски термини само до државне границе. Настојаћемо да пратимо палеогеографске јединице које су откривене са обе стране границе и називаћемо их по предности њиховог обележавања.

Те јединице су строго палеогеографске, али палеогеографија је предодређена јурском тектоником у овом делу Балканског полуострва. Ове палеогеографске јединице имају двоструку структуру, односно изграђене су од две групе слојева – доња (доња јура до доњег каловеја) и горња (средњи каловеј–титон). На основу разлика ова два дела реконструисали смо главне палеогеографске јединице у проучаваној области. Шта је карактеристично за јуру ових јединица? Јединица Тракијског масива је без јурских седимената; јединица Лужница–Кониаво делимично садржи лијас у грестенској фацији и дубоководне средњокеловејске–кимеријске (р. р.) седименте типа "*ammonitico rosso*" и горњокимеријско–титонски силикокластични флиш; Гетска јединица је подељена на Западногетску подјединицу са доњојурским седиментима и Источногетску подјединицу са доњојурским континенталним и морским седиментима, праћена у обе подјединице кречњацима карбонатне платформе (типа Страмберк); Инфра(суб)гетска јединица садржи релативно дубоководне лијаске и догерске седименте (догер типа "црних глинаца са *Bossitra alpina*") и средњокеловејско–титонске типа "*ammonitico rosso*"; Данубијска јединица садржи плитководни лијас, догер и малм (зона Мироч–Вршка Чука) и дубоководни догер и малм у Доњомилановачко–новокоритској зони.